Required—True amplitude, and error of the compass; and, supposing the variation to be 22° 30′ W., required the deviation of the compass for the direction of the ship's head.

2. Required the true course and distance from B to C by calculation on Mercator's principle; also the compass course, assuming the variation to be 10° E., and the deviation of your compass 17° W.: Lat. of B, 36° 22′ S.; long. 175° 33′ E. Lat. of C, 48° 24′ N.; long. 124° 46′ W.
3. On 31st March, 1925, in long. 140° 20′ W., when a chronometer (corrected) indicated mean time at Greenwich 12 h. 24 m. 20 s., the observed altitude of the Pole Star, out of the meridian, was 49° 30′, height of eye 21 ft.

   Required—The latitude.
4. On 25th August, 1925, at about 03 h. 00 m. at ship, in lat. by account 51° 40′ N., long. by account 150° 15′ W., when a chronometer showed 13 h. 06 m. 52 s., which was fast for mean time at Greenwich, 2nd July, 1925, 10 m. 33 s., and losing 1·5 s. daily, the observed altitude of the star α Cephei (Alderamin) was 57° 45′ west of meridian, and the observed altitude of the star Tauri (Nath) taken at the same time was 39° 04′ east of meridian, height of eye 22 ft.

   Required—The position of the ship and the true bearing of the stars.

2. General Mathematical Paper.

Time allowed 3 hours.

1. On 28th May, 1925, in lat. 12° 15′ N., long. 112° 20′ W., when a chronometer, correct for mean time at Greenwich, indicated 15 h. 22 m. 19·6 s., find the sun's true altitude and azimuth.
2. Find a value for the angle A which will satisfy the following equation:—

$$\operatorname{cosec}^2 A + \frac{1}{\sin A} + \frac{\sqrt{1 + \tan^2 A}}{\tan A} = 19$$

3. To an observer in the same horizontal plane as the base of a perpendicular cliff 250 ft. high, a flagstaff 50 ft. high on the top of the cliff subtended the same angle as that subtended by an object 10 ft. high at the base of the cliff.

   Find the distance of the observer from the cliff.
4. Draw a figure and prove that

$$\tan A = \frac{\sin 2A}{2\cos^2 A}$$

5. Prove that if two straight lines cut one another, the vertically opposite angles are equal.
6. Find the area of a quadrilateral inscribed in a circle, the sides of the quadrilateral being 10, 8, 9, and 7 ft. respectively.

3. Magnetism.

Time allowed 2 hours.

1. Assuming coefficient B to be—6° 30′, and coefficient C to be −10° 30′:

   Required—The direction of the ship's head whilst building, assuming that B and C resulted altogether from permanent magnetism.
2. The deviations observed with ship's head by compass being as follows, compute the value of the coefficients A, B, C, D, and E, and from them find the deviation for ship's head by compass S. 31° W.:—

At North, deviation	16° 00′ W.	At South, deviation	16° 00′ E.
,, N.E., ,,	1° 34′ W.	,, S.W., ,,	12° 34′ E.
,, East, ,,	6° 00′ E.	,, West. ,,	6° 00′ W.
,, S.E., ,,	10° 04′ E.	,, N.W., ,,	21° 04′ W.

3. On 6th October, 1925, at 05 h. 20 m. apparent time at ship, in lat. 30° 30′ N., long. 135° 27′ W., the star α Hydrae (Alphard), east of meridian, bore by compass S. 79° 30′ E.

   Compute the true azimuth and thence the deviation of the compass, assuming the variation to be 14° 10′ E.
4. With the ship's head N.E. by N. by compass, heeling to port 6°, the heeling-error was found to be 7° 00′ easterly.

   Required—The probable heeling-error with ship's head S. by E., by the same compass, and heeling 4° to starboard.